IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Satoru TOMARU *et al.*

Application No: 09/272,303

Confirmation No: 5475

Filed: March 19, 1999

For: METHOD FOR PRODUCING A MULTI-MODE OPTICAL WAVEGUIDE (As Amended)

Art Unit: 1756

Examiner: Mr. Martin J. Angebranndt

Atty. Docket No: 32307-147486

Customer No:
26694
PATENT TRADEMARK OFFICE

DECLARATION UNDER 37 C.F.R.§ 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Satoru Tomaru, am an inventor of the above-identified patent application and declare as follows:

1. I am currently employed by NTT Advanced Technology Corporation where I am an Executive Engineer at Optical Device Department.

2. I am fully familiar with the invention described and claimed in the present patent application. I have read the Office Action dated May 19, 2003, rejecting claims in the present patent application. It is my understanding that the patent Examiner believes that the advantage of the present invention which is caused by irradiating a layer of the mixture in liquid form having 500 cps to 10,000 cps has not been shown with concrete data in record.

3. In the experiments reported herein, the substance EHPE-3150 was employed. It has a softening point of 85±10° C and is a solid at room temperature. Therefore, in order to obtain a thin film of EHPE-3150, it must be dissolved in organic solvents such as THF with a photo initiator, followed by spin-coating the resultant solution and curing by irradiation of ultraviolet light.

In this situation, EHPE-3150 is present as solid in the spin-coated film, regardless of whether it is photo-cured or not. So, there is a disadvantage that scattering loss of the spin-coated film increases where thickness of the film is several micrometers or more. Further, the photo-cured film of EHPE-3150 has a scattering loss of greater than 1 dB/cm for a 0.85 μm light.

In producing a film by spin-coating and photo-curing EHPE-3150, selection of solvents is important. Alcoholic solvents such as methanol have insufficient solubility, so that a film having a thickness of several micrometers become clouded to give high scattering loss. The high scattering loss makes the film inappropriate to use as a waveguide.

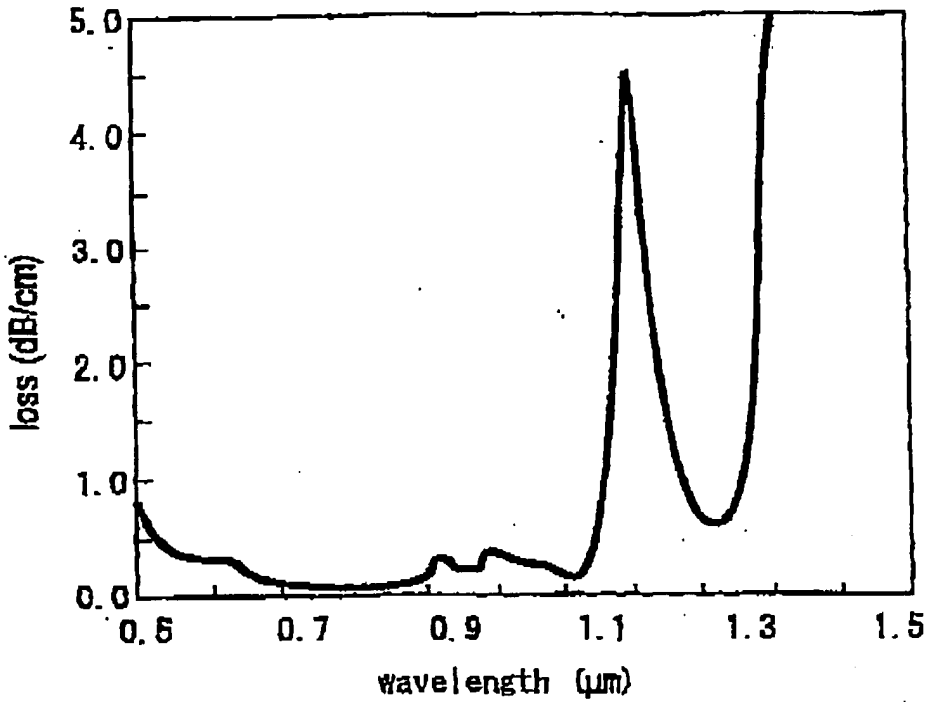
In contrast to the above, when the method of the present invention is used, a highly transparent film having a loss of 0.1 dB/cm or less for a 0.85 μm light can be obtained even in a large thickness of several ten micrometers. By comparison, the present invention, where a film in liquid state is irradiated by ultraviolet light for curing, has a great advantage over the prior art.

4. I prepared a solution comprising 50 wt.% of EHPE-3150 and 1 wt.% of photo-initiator in THF, the viscosity of the solution being 2000 cps. Then, I spin-coated the solution onto a silicon substrate at 1000 rpm and dried the coated film. The dried film had a thickness of 5 μm. Finally, the dried film was irradiated with an ultraviolet light for curing. The cured film exhibited a scattering loss of 10 dB/cm at 0.85 μm.

5. I spin-coated the above solution onto a silicon substrate and dried it to form a film having a thickness of 20 μm. The resultant film was heavily clouded so that scattering loss cannot be measured.

6. I prepared a solution comprising 70 wt.% of EHPE-3150 and 2 wt.% of photo-initiator in THF, the viscosity of the solution being 4000 cps. Then, I spin-coated the solution onto a silicon substrate at 1000 rpm and dried the coated film. The dried film had a thickness of 10 μm. However, the resultant film was heavily clouded so that scattering loss cannot be measured.

7. I prepared a photosensitive resin material (A) as described in Embodiment 1 of the present specification, and spin-coated it to form a film in liquid state, the film having a thickness of 30 μm. Without any drying procedure, the film was irradiated with ultraviolet light to form a cured film having a thickness of 30 μm. The resultant film exhibited a scattering loss of 0.1 dB/cm for a 0.85 μm light, although it has a large thickness of 30 μpm. The following graph shows a SCATTERING loss of the above-obtained film for a light of 0.5 to 1.5 μm.



I declare under penalty of perjury under the laws of the United States of America all statements made of my own knowledge are true and correct.

Executed on this 15 day of September, 2003.

Satoru Tomaru

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